IN THE CLAIMS:

1. A staggered torsional electrostatic combdrive, comprising:

a stationary combteeth assembly; and

a moving combteeth assembly including a mirror and a torsional hinge, said moving combteeth assembly being positioned entirely above said stationary combteeth assembly by a predetermined vertical displacement during a combdrive resting state.

2. The staggered torsional electrostatic combdrive of claim 1 wherein said mirror is formed of single-crystal silicon.

3. The staggered torsional electrostatic combdrive of claim 2 wherein individual moving combteeth of said moving combteeth assembly are positioned between individual stationary combteeth of said stationary combteeth assembly during a combdrive activation state, and said mirror intersects the plane defined by said stationary combteeth during said combdrive activation state.

4. The staggered torsional electrostatic combdrive of claim 3 wherein said mirror pivots about said torsional hinge during said combdrive activation state.

5. The staggered torsional electrostatic combdrive of claim 1 wherein said predetermined vertical displacement is between 0.2 and 3.0 microns.

6. The staggered torsional electrostatic combdrive of claim 1 wherein said moving combteeth assembly further includes an anchor, said torsional hinge being positioned between said mirror and said anchor.

7. The staggered torsional electrostatic combdrive of claim 1 wherein said moving combteeth assembly has a thickness of between 10 and 500 microns.

8. The staggered torsional electrostatic combdrive of claim 7 wherein said moving combteeth assembly has a thickness of between 50 and 100 microns.

9. The staggered torsional electrostatic combdrive of claim 1 wherein said mirror has a lateral length of less than 10 millimeters.

10. The staggered torsional electrostatic combdrive of claim 1 wherein said mirror has a lateral length of between 550 and 2000 microns.

11. The staggered torsional electrostatic combdrive of claim 1 said moving combteeth assembly has a comb tooth gap of between 2-30 microns between individual combteeth of said moving combteeth assembly.

12. The staggered torsional electrostatic combdrive of claim 1 wherein the position of said moving combteeth assembly is adjusted in response to a capacitance value measured between said moving combteeth assembly and said stationary combteeth assembly.

13. The staggered torsional electrostatic combdrive of claim 1 further comprising a stacked combteeth assembly positioned over said stationary combteeth assembly.

14. The staggered torsional electrostatic combdrive of claim 13 wherein the position of said moving combteeth assembly is adjusted in response to a capacitance value measured between said moving combteeth assembly and said stacked combteeth assembly.

15. The staggered torsional electrostatic combdrive of claim 13 wherein said stacked combteeth assembly is operated to alter the resonant frequency of said moving combteeth assembly.

16. The staggered torsional electrostatic combdrive of claim 1 wherein said moving combteeth assembly includes a combteeth spine with a first set of individual combteeth extending in a first direction from said spine and a second set of individual combteeth extending in a second direction from said spine.

17. The staggered torsional electrostatic combdrive of claim 16 further comprising an additional stationary combteeth assembly positioned to selectively engage said second set of individual combteeth; wherein said first set of individual combteeth selectively engages said stationary combteeth assembly.

18. The staggered torsional electrostatic combdrive of claim 17 wherein the position of said moving combteeth assembly is adjusted in response to a capacitance value measured between said moving combteeth assembly and said additional stationary combteeth assembly.

19. The staggered torsional electrostatic combdrive of claim 17 further comprising a stacked combteeth assembly positioned over said additional stationary combteeth assembly.

20. The staggered torsional electrostatic combdrive of claim 19 wherein the position of said moving combteeth assembly is adjusted in response to a capacitance value measured between said moving combteeth assembly and said stacked combteeth assembly.

21. The staggered torsional electrostatic combdrive of claim 1 further comprising transparent substrates enclosing said stationary comb teeth assembly and said moving comb teeth assembly.

22. The staggered torsional electrostatic combdrive of claim 1 wherein said mirror includes a reflective material.

23. The staggered torsional electrostatic combdrive of claim 1 wherein said mirror includes a multilayer optical filter.

24. A staggered torsional electrostatic combdrive, comprising:

a stationary combteeth assembly; and

a moving combteeth assembly including a paddle and a torsional hinge, said moving combteeth assembly being positioned entirely above said stationary combteeth assembly by a predetermined vertical displacement during a combdrive resting state.

25. The staggered torsional electrostatic combdrive of claim 24 wherein said paddle supports a mounted electronic component.

26. The staggered torsional electrostatic combdrive of claim 25 wherein said mounted electronic component is an ultrasonic transducer.

27. The staggered torsional electrostatic combdrive of claim 25 wherein said mounted electronic component is an ultrasonic sensor.

28. A method of fabricating a staggered torsional electrostatic combdrive, said method comprising the steps of:

deep trench etching a stationary combteeth assembly in a first wafer;

bonding a second wafer to said first wafer to form a sandwich including said first wafer, an oxide layer, and said second wafer;

forming a moving combteeth assembly in said second wafer, said moving combteeth assembly including a paddle and a torsional hinge, said moving combteeth assembly being separated from said first wafer by said oxide layer; and

removing exposed portions said oxide layer to release said staggered torsional electrostatic combdrive.

29. The method of claim 28 wherein said forming step includes a first step of etching an external surface oxide layer and a second step of etching said second wafer to form said moving combteeth assembly.

30. The method of claim 28 further comprising the step of depositing a reflective film on said paddle.

Add B1

add C3
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